

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Thomas E, Kocovsky Jr. Reg. No. 28,383** on Nov. 24th 2008 along with authorization to charge any necessary fees to applicant's deposit account.
3. The application has been amended as follows:

- A) Replace claim 1 of the July 18, 2008 amendment in response with the following Examiner amended claim 1:

Claim 1 --- A method of improved coil sensitivity estimation **and** reducing artifacts in an MRI apparatus utilizing parallel imaging, the method comprising:

for a parallel imaging sequence, performing at least one calibration sequence in conjunction with a parallel imaging sequence, using one of:

 a spin echo type sequence matching **an** in-plane phase encode direction of both of the calibration and the parallel imaging sequences for each calibration; and

 a gradient echo type sequence matching **the** in-plane phase encode direction of both of the calibration and the parallel imaging sequences for each calibration;

reading out induced resonance signals;

processing the read out resonance signals in order to generate an MRI image; and

outputting the processed signals to a display or user or recording the processed signals to a computer-readable medium. . ---

B) Replace claim 2 of the July 18, 2008 amendment in response with the following
Examiner amended claim 2:

Claim 2 --- The method as set forth in **claim 1**, wherein a plurality of parallel imaging sequences are performed and the calibration sequence is performed for each of the plurality of parallel imaging sequences. ---

C) Replace claim 9 of the July 18, 2008 amendment in response with the following
Examiner amended claim 9:

Claim 9 --- A magnetic resonance imaging (MRI) apparatus comprising:

an open magnet system **generating** a B_0 magnetic field transverse to a long axis of a subject in an examination zone;

an RF system **exciting and manipulating** magnetic resonance in the examination zone;

a gradient system spatially **encoding** the magnetic resonance;

a plurality of RF receive coils with differing sensitivity profiles **receiving** resonance signals in parallel;

a reconstruction processor **reconstructing** received resonance signals into **MRI** image representations;

a calibration processor **generating** sensitivity profiles of the RF receive coils from image representations generated during a calibration scan;

a reconstruction processor **generating** a diagnostic image from the sensitivity profiles and **the MRI** image representations;

sequence control **accessing** a calibration sequence memory **in order to** retrieve an RF refocused spin echo type sequence and **controlling** the RF system and the gradient system in accordance with the retrieved calibration sequence **in order to** generate resonance signals for the reconstruction processor **to** reconstruct into calibration image representations **and the sequence control also accessing** a diagnostic imaging sequence memory in order to retrieve a diagnostic imaging sequence and **controlling** the RF system and the gradient system **in order to** generate resonance signals for the reconstruction processor to reconstruct into the diagnostic image representations;

wherein the sequence control retrieves a phase encode gradient direction from the diagnostic imaging sequence memory and causes the gradient system to apply a phase encode gradient during the calibration sequence which is in the retrieved phase encode direction. ---

D) Replace claim 13 of the July 18, 2008 amendment in response with the following Examiner amended claim 13:

Claim 13 --- A magnetic resonance method comprising:

prior to conducting a parallel imaging sequence in which resonance data is phase encoded in a selected phase encode direction and resonance data is read out with a selected read gradient, conducting a calibration sequence including:

generating a series of spin echoes;

phase encoding the spin echoes in said selected phase encode direction;

generating sensitivity maps from the spin echoes;

conducting the parallel imaging sequence to generate resonance data;

reconstructing the resonance data into folded images;
unfolding the folded images using the generated sensitivity maps;
**outputting the unfolded images to a display or to a user or recording
the unfolded images to a computer-readable medium. ---**

- E) Replace claim 18 of the July 18, 2008 amendment in response with the following Examiner amended claim 18:

Claim 18 ---The method as set forth in **claim 17**, wherein the calibration sequence uses spin echoes which refocus[es] phase errors, effectively cancelling the phase errors

The following is an examiner's statement of **Reasons for Allowance**:

4. With respect to examiner amended independent claims 1, 9 and 13: These claims are considered to be allowable over the prior art of record because the prior art of record neither discloses nor suggests an MRI apparatus/method comprising the combinational features of the claims set forth herein in the examiners amendment above. It is the entire combination of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims.
5. With respect to the dependent **claims 2-7, 10, 12, and 14-19** each of these claims is considered to be allowable by the Examiner because they each depend from an allowable examiner amended independent claim.
6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Prior Art made of Record

Art Unit: 2831

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- A) Zhu et al., US Patent 7,009,396 B2 issued March 7th 2006 in view of
- B) Watkins et al., US patent 6,492,814 issued Dec. 10th 2002.
- C) ZHANG, Q., et al.; Improving True-FISP Parallel Cine Imaging using a New Data-acquisition Scheme for Coil Sensitivity Calibration; 2003; Proc. Intl. Soc. Mag. Reson. Med.; 11:2329., which was supplied by the applicant's July 12th 2006 IDS statement and will be referred to hereafter as the ZHANG et al., article.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday, Wednesday, and Friday-Thursday from 7:00am to 2:10 pm., and on Tuesday and Thursday from 7:00am to 5:30pm.

9. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Diego Gutierrez**, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is (571) 273-8300.

10. Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system Status information for published applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PMR only. For more information about the PMR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PMR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Brij B Shrivastav/
Primary Examiner, Art Unit 2831

/TAF/
December 9, 2008